May 6, 1969 C. C. DIEHL 3,442,602

METHOD AND MECHANISM FOR DEODORIZING POLLUTED ATMOSPHERIC AIR

Filed July 9, 1964 Sheet 1 of 2

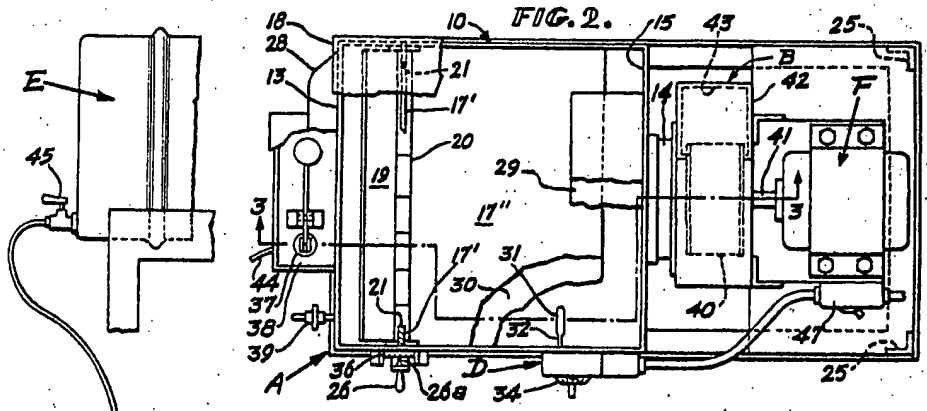


FIG. 1.

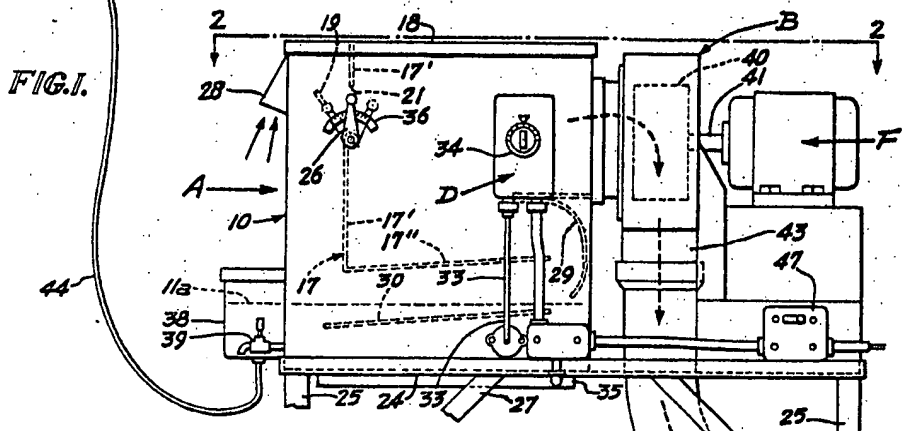
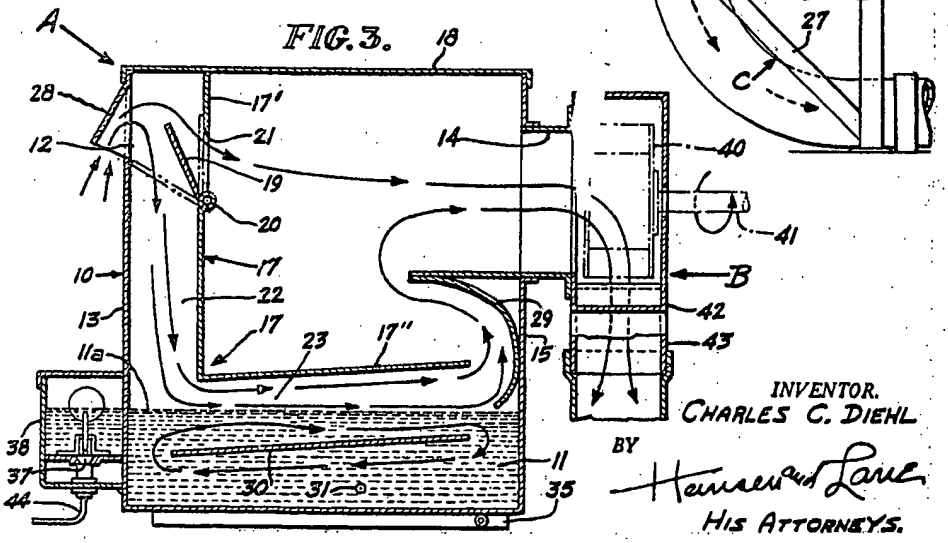


FIG. 3.



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METHOD AND MECHANISM FOR DEODORIZING FOLLUTED ATMOSPHERIC AIR

Filed July 9, 1964 Sheet 2 of 2

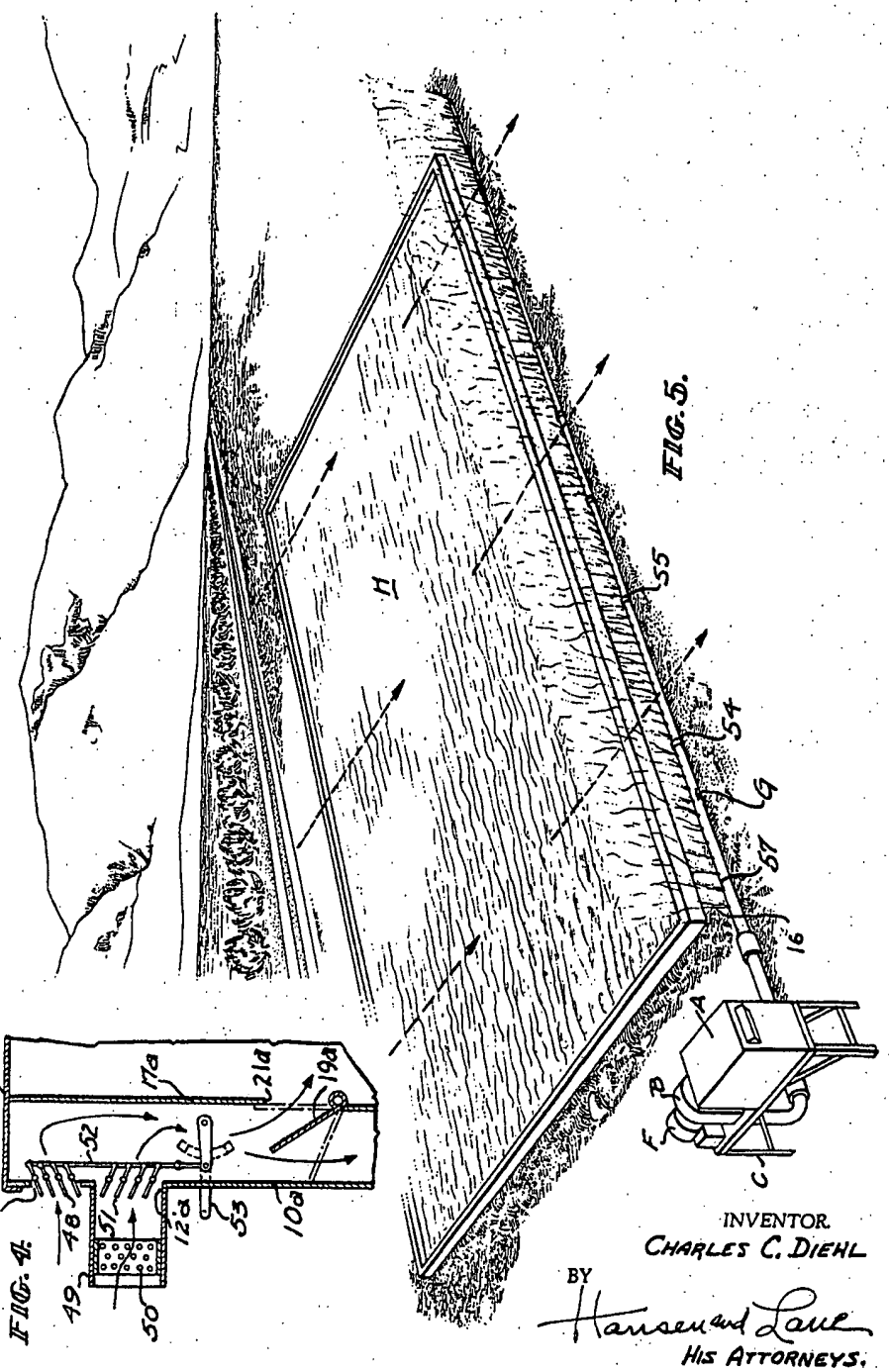

FIG. 5.

FIG. 4.

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METHOD AND MECHANISM FOR DEODORIZING POLLUTED ATMOSPHERIC AIR

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U.S. Cl. 21—53 5 Claims

ABSTRACT OF THE DISCLOSURE

A method and apparatus for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation, which method comprises injecting transversely into the stream of polluted air a plurality of high velocity jets of deodorant fluid, said injection taking place on the downward side and close to said industrial installation.

An object of the invention is to provide an improved mechanism for entraining controlled amounts of deodorant vapor emanating from a pool of vaporizable deodorant liquid in a high velocity air stream, and for discharging the thus vaporized air stream in the form of a plurality of high velocity jets transversely through a moving mass of polluted atmospheric air to deodorize it.

The foregoing objects and advantages of the invention, will be apparent from the following description and the accompanying drawings, wherein:

FIG. 1 is a side elevational view of a vaporizing mechanism for entraining deodorant vapors in a high velocity air stream, baffles and a control gate being shown in dotted lines.

FIG. 2 is a top plan view looking in the direction of the arrows 2—2 of FIG. 1 with the top cover of the housing tank removed, portions being broken away.

FIG. 3 is a sectional view taken along line 3—3 of FIG. 2, the arrows indicating air and liquid flow paths.

FIG. 4 is a fragmentary sectional view taken similarly to FIG. 3 and showing the air inlet portion thereof, an air heater being mounted to heat a portion of the incoming air.

FIG. 5 is a perspective view showing an operational installation embodying the present invention.

Briefly, the illustrated embodiment of the invention comprises a vaporizer A having a housing tank 10 adapted to hold a quantity of vaporizable, deodorant liquid 11 therein, for example, to the depth indicated by the broken line 11*a* of FIG. 3. The temperature of the liquid 11 is controlled by a thermostat D.

An air inlet opening 12 is provided in the front wall 13 of the housing tank 10, while an air outlet 14 in the rear wall 15 of the housing tank 10 is coincident with the inlet of a sirocco type blower B. An upright portion 17' of a baffle 17 extends downwardly from a housing tank top closure cover 18, and a horizontal portion 17" of this same baffle extends rearwardly from the lower end of the upright portion 17' a short distance above the top surface of the liquid 11 in the housing tank 10, terminating short of the rear wall 15 thereof.

An air proportioning control gate 19 is hingedly mounted at 20 adjacent an opening 21 in the upright baffle portion 17*a* to control the amount of incoming air which is bypassed through the opening 21 to the blower, and that which is deflected downwardly through a passage 22 between the upright baffle portion 17' and the housing tank front wall 13, and thence through a continuing passage 23 between the horizontal baffle portion 17" and the top surface of the liquid 11.

These portions of the divided air stream again unite

within the housing tank above the baffle portion 17*b* and are drawn into the blower B, whence they emerge in the form of a high velocity vapor laden air stream. This vapor laden air stream is discharged by the blower B into a pipe G, laid along the leeward side of an installation, such as a sewage effluent pond H (FIG. 5), from which undesirable odors are being emitted. A plurality of apertures are provided at spaced intervals along the exposed upper side of this pipe to discharge jets 16 of vapor laden air into and through the wind-borne mass of polluted air from the pond, to commingle with, and thereby to deodorize this polluted air mass.

Referring to the drawings in greater detail, the vaporizer A comprises a supporting frame C (FIG. 1) which may be of suitable structural material, such as, for example, angle iron. The illustrated frame comprises a top frame 24, support legs 25, and diagonal bracing members 27. The housing tank 10 mounted on the frame C may be fabricated from suitable material, such as, for example, stainless or galvanized sheet steel. The illustrated housing tank 10 is of rectangular shape, although the shape and proportions thereof are not material to the invention.

The tank closure cover 18, which may also be of sheet metal, has flanged, overlapping relation with the upper end of the housing tank 10, and rests on the upper edge of the tank, and the upright portion 17' of the baffle 17. Since during operation of the vaporizer the interior of the housing tank 10 is under reduced pressure due to the suction of the blower B, the cover 18 provides an effective closure seal for the upper end of the housing tank 10 and the upper edge of the baffle 17. However, if desired, the tank cover 18 may be sealed to the housing tank walls and to the baffle 17 by conventional rubber or other seals (not shown). The housing tank inlet opening 12 preferably is shielded from the elements by an awning-like hood 28 of sheet metal, since the illustrated mechanism is intended for outdoor installation.

As shown in FIGS. 1–3, the air proportioning control gate 19 is hingedly mounted on the baffle 17 at the bottom of the baffle opening 21, and is secured to the pin of the mounting hinge 20. The position of the gate 19 is controlled by a lever arm 26, which is secured to a projecting portion of the hinge pin. A notched quadrant 36 is secured to the side of the tank housing 10, and engages a detent 26*a* on the lever arm 26 to retain the latter, and the control gate 19 attached thereto, in adjusted position. The control gate 19 is arranged to swing from its dash-one-dot line position of FIG. 3, in which position the baffle opening 21 is closed, and the passage 22 between the upright baffle portion 17*a* and the forward tank wall 13 is fully open; to its dash-two-dot line position of FIG. 3, wherein the baffle opening 21 is fully exposed, and the passage 22 is closed off.

In the dash-dot line position (FIG. 3) of the gate 19, all of the air entering the inlet opening 12 in the tank wall 13 is directed downwardly through the passage 22, thence laterally through the continuation 23 of this same passage, and thence is deflected upwardly and forwardly around the rear edge of the horizontal baffle portion 17" by a curved deflector 29 provided for this purpose and is drawn into the inlet of the blower B.

When the gate 19 is in other than its fully closed, dash-dot line position of FIG. 3, at least a portion of the air entering the inlet opening 12 is by-passed through the baffle opening 21 and into the inlet of the blower B through the opening 14. Adjustment of the angular position of the control gate 19 between the two extreme positions illustrated in FIG. 3 controls the proportionate amounts of incoming air which passes along these two routes.

An immersed baffle 30, which may be slightly inclined from the horizontal, is provided transversely across the

lower portion of the housing tank 10 below the liquid level 11*a* therein. The baffle 30 preferably extends the entire width of the housing tank 10, and terminates short of its forward and rear walls 13 and 15. Surface friction of the air flowing through the passage 23 on the liquid surface 11*a* induces a current flow in the liquid 11 in the housing tank 10 about the baffle 30 as indicated by the arrows in FIG. 3.

A suitable velocity of air flow through the passage 23 is at a rate of approximately 1000 lineal feet per minute, and at this speed the surface of the liquid is whipped into waves, and spray droplets are thrown up into the air stream. Most of these droplets impinge on the deflector 29, and then flow back into the tank, although some of them may remain entrained in the air stream, which does no harm since they eventually evaporate. The reduction in air pressure within the housing tank 10 caused by the operation of the blower B assists in the evaporation of the deodorant liquid 11.

A conventional thermostatic control bulb 31 (FIGS. 2 and 3) is immersed in the liquid 11, and is operatively connected by a conventional capillary tube 32 enclosed in a larger protective tube 33 to a conventional thermostat D having a manually adjustable dial 34 thereon to control the energization of an electrical heating coil 35. The latter preferably is mounted directly beneath the housing tank bottom as shown in FIG. 3, and preferably is of a waterproof type, such as a well-known Calrod unit.

A conventional float-controlled valve 37 is mounted in a float chamber 38, which communicates with the interior of the housing tank 10, and controls the flow of vaporizable deodorant liquid from a supply thereof contained in an elevated reservoir E to maintain the liquid 11 in the housing tank 10 at a desired level, such as that indicated by the dotted line 11*a* in FIG. 3. A conventional drain cock 39 is provided at a low point in the housing tank 10 to permit the liquid to be drained therefrom when it is desired to clean the tank.

The blower B preferably is of a conventional sirocco type, having a multi-bladed, centrifugal impeller wheel 40 mounted on a shaft 41 and driven by suitable power means such as an electric motor F of suitable power and speed. The impeller wheel 40 is mounted in a conventional convolute housing 42 to draw air inwardly into the eye of the impeller wheel 40, and to discharge it at high speed and substantial pressure through the outlet 43 of the blower housing 42.

The operation of the vaporizer A is as follows: With the drain cock 39 closed, and with a supply of suitable vaporizable deodorant liquid 11 in the elevated storage reservoir E, the control cock 45 (FIG. 1) is opened, thereby allowing the deodorant liquid to flow into the housing tank 10, whereupon the float valve maintains the required liquid level therein in a customary manner. The thermostat D is also adjusted by means of the control dial 34 to maintain the liquid 11 in the housing tank 10 at a desired temperature. A control switch 47 is then closed to energize the blower motor F, and also to provide energy for the heating coil 35 when called for by the thermostat D.

The air proportioning control gate 19 is adjusted to a desired angular position to control the proportion of air entering the inlet 12 which is deflected through the passages 22 and 23 to entrain vapors from the liquid 11, and that which is bypassed through the baffle opening 21. These two air streams are again commingled as the vapor laden air stream is discharged upwardly into the housing around the rear edge of the baffle portion 17'', and the commingled vapor bearing air mass is then drawn into and through the blower B, and is discharged thence at high velocity and substantial pressure through the discharge outlet 43 of the blower housing.

In the modified arrangement shown in FIG. 4 a portion of the air is heated as it enters the housing tank 10, and this modified arrangement may be used either in addition to, or in place of the heating means for the liquid shown in FIGS. 1–3. The parts of the structure shown in FIG. 4 which correspond to those shown in FIGS. 1–3 are designated by the same reference numerals with the suffix *a* added.

In FIG. 4 an upper air inlet opening 12*a* has a plurality of louvers 48 mounted therein to control the flow of air inwardly therethrough. A second, hot air inlet opening 12*a'* has a short, rectangular pipe 49 extending outwardly therefrom, and air heating means 50, consisting of a plurality of conventional, finned heating elements, such as, for example, Calrod elements, are mounted transversely across the interior of this pipe 49. Energization of these heating elements is controlled by conventional electric switch means (not shown).

A second set of louvers 51 is provided to control the flow of air into this second opening 12*a'*. A link 52 connects both sets of louvers 48 and 51, and is so connected that as the upper set of louvers is closed, the lower set is opened, and vice versa. A control lever 53 is connected to the link 52 to permit manual adjustment of both sets of louvers as required. Thus by energizing the heating means 50, and adjusting the louvers 48 and 51 to permit required proportions of air to enter the inlet openings 12*a* and 12*a'* the temperature of the incoming air can be closely controlled.

Referring now to FIG. 5, which shows the overall installation, the pipe G, which is coupled to the discharge opening of the blower housing 42, is initially of substantially the same cross sectional area as the blower discharge opening, but is reduced in gradual increments as at 54 and 55 in order to maintain adequate internal pressure throughout its entire length. A plurality of jet discharge openings 57 are provided at spaced intervals along the exposed upper side of the pipe G, and through these openings are discharged the deodorizing vapor jets 16. These vapor jets as shown in FIG. 5 have the appearance of spray, although obviously, being of vapor bearing air, they actually would be invisible. The long, transverse, dotted arrows in FIG. 5 indicate the direction of the prevailing wind, and in some areas the prevailing wind is so constant as to require a pipe G along one side only of the installation to be controlled. However, if the winds in an area where an installation is to be made are variable, similar pipes will necessarily be laid along each side of the installation toward which the winds are apt to blow, and in some instances it may be necessary to have duplicate vaporizers A, and a similar pipe along each side of the installation. In such cases, conventional deflector means for directing the high speed vapor bearing air stream into a selected one or more of such pipes will be provided so as to be able to project the jets 16 into the polluted atmospheric air on the leeward side of the installation regardless of wind direction. Since such duplicate vaporizers, pipes and deflectors can readily be provided by any ordinarily skilled person, it will be unnecessary to illustrate or describe such modifications herein.

The invention provides a simple and effective mechanism for deodorizing large atmospheric air masses which have been polluted by industrial installations.

While I have illustrated and described a preferred embodiment of the present invention, and one modified form thereof, it will be understood, however, that various changes and modifications may be made in the details thereof without departing from the scope of the invention as set forth in the appended claims.

Having thus described the invention, what I claim as new and desire to protect by Letters Patent is defined in the following claims.

1. A mechanism for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation and comprising

a pipe laid along the leeward side of, and closely adjacent, such installation, the pipe having a plurality

of jet orifices therein distributed at spaced intervals throughout the length of the pipe, the jet orifices being directed toward, and transversely to the direction of flow of said polluted, wind-borne mass of atmospheric air,

means for introducing a high velocity air stream into the pipe for discharge therefrom through the jet orifices and transversely into the polluted air mass as it is wind-borne transversely across the pipe, and

means for entraining vaporized deodorant material in the high velocity air stream prior to its discharge from such orifices.

2. A mechanism for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation and comprising

a pipe laid along the leeward side of, and closely adjacent, such installation with the upper side of the pipe exposed and having a plurality of jet orifices therein distributed at spaced intervals throughout the length of the pipe, the jet orifices being directed toward, and transversely to the direction of flow of said polluted, wind-borne mass of atmospheric air,

means for introducing a high velocity air stream into the pipe for discharge through the jet orifices and transversely into the polluted air mass as it is wind-borne transversely across the pipe, and

means for entraining vaporized deodorant material the high velocity air stream prior to its discharge from such orifices.

3. A mechanism for deodorizing a mass of polluted wind-borne atmospheric air emanating from an industrial installation and comprising

an enclosed tank housing having an air inlet and an air outlet,

a pool of vaporizable deodorant liquid in the bottom of the tank housing,

a suction blower having a suction inlet and a pressure outlet mounted with its suction inlet fitted onto the housing tank outlet to draw air into the tank housing inlet, through the tank housing and to discharge it in a high velocity air stream from the blower outlet,

baffle means in the tank housing for directing air drawn into the tank housing inlet by the operation of the suction blower across the surface of the pool of deodorant liquid to entrain deodorant vapor emanating therefrom,

a pipe fitted onto the blower outlet and extending along the leeward side of such industrial installation, said pipe having a plurality of jet orifices therein distributed at spaced intervals throughout the length of the pipe,

for discharging such air with its entrained deodorant vapors through the jet orifices in the pipe in the form of jets directed transversely into the polluted air mass as it is wind-borne transversely across the pipe.

4. A mechanism for deodorizing a mass of polluted, malodorous, wind-borne atmospheric air emanating from an industrial installation and comprising

a plurality of jet-discharging elements distributed at symmetrically spaced intervals along the downstream side, and throughout substantially the entire width of, such air-borne mass of polluted air, said jet-discharging elements being directed toward, and transversely of the direction of flow of, said airborne stream of polluted air, and

means for supplying deodorant fluid at pressures substantially above atmospheric pressure to the jet-discharging elements for discharging jets of the deodorizing fluid transversely into the polluted air stream to deodorize it.

5. The method of deodorizing a mass of malodorous, polluted, atmospheric air flowing in the form of a wind-borne stream in a known direction from an industrial installation, which method comprises injecting into the wind-borne stream of polluted air, on the downwind side thereof and close to said installation, a plurality of high velocity jets of deodorant fluid, said jets being directed into the mass of polluted air transversely of its direction of flow.

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U.S. Cl. X.R.

21—61, 74, 121, 122